**Saitechinfo NEET JEE Academy**

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# DETERMINANTS

## Class 12 - Mathematics

**Time Allowed: 1 hour and 30 minutes** **Maximum Marks: 45**

1. The solution of system of equations x + (sin $\alpha$)y = 1 and (sin $\alpha$)x + 4y = 2 satisfying x $\geq \frac{4}{5}$ and y $\leq \frac{1}{2}$, then **[1]**

   a) $\alpha \in \left|1, \frac{\pi}{6}\right|$ b) $\alpha \in \left|\frac{\pi}{6}, \frac{\pi}{2}\right|$

   c) $\alpha \in \left|\frac{\pi}{4}, \frac{\pi}{3}\right|$ d) $\alpha \in \left|0, \frac{\pi}{6}\right|$

2. The roots of the equation det. $\begin{vmatrix} 1-x & 2 & 3 \\ 0 & 2-x & 0 \\ 0 & 2 & 3-x \end{vmatrix} = 0$ are **[1]**

   a) 3 b) 2 and 3

   c) 1 , 2 and 3 d) 1 and 3

3. Let A = $\begin{bmatrix} 1 & 0 & 0 \\ 5 & 2 & 0 \\ -1 & 6 & 1 \end{bmatrix}$, then adj (A) is **[1]**

   a) $\begin{bmatrix} 2 & -5 & 32 \\ 0 & 1 & 6 \\ 0 & 0 & 2 \end{bmatrix}$ b) $\begin{bmatrix} 2 & -25 & -32 \\ 0 & 2 & -36 \\ 0 & 0 & 1 \end{bmatrix}$

   c) $\begin{bmatrix} 2 & 0 & 0 \\ -25 & 2 & 0 \\ -32 & 36 & 1 \end{bmatrix}$ d) $\begin{bmatrix} 2 & 0 & 0 \\ -5 & 1 & 0 \\ 32 & -6 & 2 \end{bmatrix}$

4. If A is an invertible matrix of order 3 and |A| = 5, then find |adj A|. **[1]**

   a) 25 b) 5

   c) -5 d) 0

5. If $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$ and $A_{ij}$ is Cofactors of $a_{ij}$, then value of $\Delta$ is given by **[1]**

   a) $a_{11} A_{31} + a_{12} A_{32} + a_{13} A_{33}$ b) $a_{21} A_{11} + a_{22} A_{12} + a_{23} A_{13}$

   c) $a_{11} A_{11} + a_{21} A_{21} + a_{31} A_{31}$ d) $a_{11} A_{11} + a_{12} A_{21} + a_{13} A_{31}$

6. If $\begin{bmatrix} x & y \\ 3y & x \end{bmatrix} \begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$ then find x and y ? **[1]**

   a) x = 2, y = 2 b) x = 1, y = 2

   c) x = 2, y = 1 d) x = 1, y = 1

7. If A is a non singular matrix and A' denotes the transpose of A, then **[1]**

   a) $|AA'| \neq |A^2|$ b) |A| - |A'| $\neq$ 0

   c) |A| + |A'| $\neq$ 0 d) $|A| \neq |A'|$

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8. If A is a 3-rowed square matrix and I3AI = k|A| then k = ? **[1]**

a) 9 b) 1

c) 3 d) 27

9. Let A and B be two invertible matrices of order $3 \times 3$. If det (ABA') = 8 and det ($AB^{-1}$) = 8, then det ($BA^{-1}B'$) is equal to **[1]**

a) 16 b) $\frac{1}{4}$

c) 1 d) $\frac{1}{16}$

10. Let A = $\begin{vmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{vmatrix}$ then $A^TA$ is **[1]**

a) $\begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix}$ b) $\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$

c) $\begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix}$ d) $\begin{vmatrix} 0 & 1 \\ 1 & 0 \end{vmatrix}$

11. If A = $\begin{bmatrix} 9 & -1 \\ 6 & -2 \end{bmatrix}$ and B = $\begin{bmatrix} -4 & 3 \\ 5 & -4 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1} A^{-1}$. **[3]**

12. Find the area of $\Delta$ whose vertices are (3, 8) (-4, 2) and (5, 1). **[3]**

13. The prices of three commodities P, Q and R are ₹ x, y and z per unit respectively. A purchases 4 units of R and sells 3 units of P and 5 units of Q. B purchases 3 units of Q and sells 2 units of P and 1 unit of R. C purchases 1 unit of P and sells 4 units of Q and 6 units of R. In the process A, B and C earn ₹ 6000, ₹ 5000 and ₹ 13000 respectively. If selling the units is positive earning and buying the units is negative earnings, find the price per unit of three commodities by using matrix method. **[3]**

14. If A and B are non-singular matrices of the same order, write whether AB is singular or non-singular. **[3]**

15. If $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$ then verify that $(AB)^{-1} = B^{-1} A^{-1}$ **[3]**

16. Solve the system of the linear equations by Cramer's rule: **[5]**

x + y = 5

y + z = 3

x + z = 4

17. Solve the system of the linear equations by Cramer's rule: **[5]**

x + y = 1

x + z = -6

x - y - 2z = 3

18. The sum of three numbers is 6. If we multiply third number by 3 and add second number to it, we get 11. By adding first and third number we get double of the second number. Find the numbers using matrix method. **[5]**

19. Two schools P and Q want to award their selected students on the values of Tolerance, Kindness, and Leadership. The school P wants to award Rs x each, Rs y each and Rs z each for the three respective values to 3, 2 and 1 students respectively with total award money of Rs2200. **[5]**

School Q wants to spend Rs 3100 to award its 4, 1 and 3 students on the respective values (by giving the same award money to the three values as school P). If the total amount of award for one prize on each value is Rs1200, using matrices, find the award money for each value.

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